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| .. | not available for a specific reference period |
| ... | not applicable |
| 0 | true zero or a value rounded to zero |
| 0s | value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded |
| p | preliminary |
| r | revised |
| x | suppressed to meet the confidentiality requirements of the *Statistics Act* |
| E | use with caution |
| F | too unreliable to be published |
| * | significantly different from reference category ($p < 0.05$) |

# Health behaviour changes after diagnosis of chronic illness among Canadians aged 50 or older

*by Jason T. Newson, Nathalie Huguet, Pamela L. Ramage-Morin, Michael J. McCarthy, Julie Bernier, Mark S. Kaplan and Bentson H. McFarland*

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## Abstract

Changes in health behaviours (smoking, physical activity, alcohol consumption, and fruit and vegetable consumption) after diagnosis of chronic health conditions (heart disease, cancer, stroke, respiratory disease, and diabetes) were examined among Canadians aged 50 or older. Results from 12 years of longitudinal data from the Canadian National Population Health Survey indicated relatively modest changes in behaviour. Although significant decreases in smoking were observed among all groups except those with respiratory disease, at least 75% of smokers did not quit. No significant changes emerged in the percentage meeting physical activity recommendations, except those with diabetes, or in excessive alcohol consumption, except those with diabetes and respiratory disease. The percentage reporting the recommended minimum fruit and vegetable intake did not increase significantly among any group.

## Keywords

Aged, cancer, diabetes, disease management, exercise, heart disease, lifestyle, middle age, nutrition, respiratory disease, secondary prevention, smoking cessation, stroke

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Heart disease, cancer, stroke, respiratory disease and diabetes are among the leading causes of death in Canada.[1] Worldwide, these chronic conditions account for 60% of all deaths.[2] Since they are influenced by modifiable behaviours, they are considered largely preventable.[3,4] For people with a chronic illness, adopting a healthier lifestyle, such as smoking cessation, increased physical activity, eliminating heavy alcohol consumption and improving diet, can extend longevity, reduce the recurrence of an event and enhance quality of life.[5-7]

Population-level information about lifestyle changes among people diagnosed with chronic conditions is lacking. Previous studies have examined behaviour change among small samples of individuals with a specific condition, and many studies have been based on retrospective accounts.[8,9] As well, most research on secondary prevention has taken place in the United States where access to health care and behaviour modification programs is variable. Only a handful of studies have been conducted in Europe or Australia where access to health care is more universal.[10,11] A literature review did not reveal any studies that used population-based data for Canada.

The present analysis examines changes in smoking, physical activity, alcohol consumption and diet in a representative sample of Canadians aged 50 or older diagnosed with a major chronic condition (see *The data*). Based on prospective design, in which behaviours are assessed before and after the diagnosis, the study avoids potential biases from retrospective accounts of post-diagnosis behaviour change.

### Smoking cessation

Smoking cessation was the most commonly reported behaviour change—the percentage of people who smoked decreased significantly following the diagnosis of heart disease, diabetes, cancer and stroke (Table 1). Among people with heart disease, for example, the prevalence of smoking declined from around 14% to less than 11%. Those

**Table 1**
**Prevalence of health behaviours pre- and post-diagnosis of selected chronic conditions by sex and age group, household population aged 50 or older, Canada, 1994/1995 to 2006/2007**

| | Total | | Sex | | | | Age group | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Men | | Women | | 50 to 64 | | 65 or older | |
| Selected chronic condition/ health behaviour | Pre-diagnosis | Post-diagnosis | Pre-diagnosis | Post-diagnosis | Pre-diagnosis | Post-diagnosis | Pre-diagnosis | Post-diagnosis | Pre-diagnosis | Post-diagnosis |
| **Heart disease (number)** | **905** | | **390** | | **515** | | **373** | | **532** | |
| Current smoker | 14.4 | 10.8* | 15.8 | 13.2‡ | 13.3 | 8.8‡ | 25.7 | 19.4‡ | 10.4 | 7.7 |
| Physically active | 51.6 | 53.9 | 54.3 | 60.2 | 49.4 | 48.7 | 47.1 | 58.5 | 53.5 | 51.9 |
| Alcohol consumption | | | | | | | | | | |
| Never or low | 62.8 | 65.6 | 49.5 | 50.3 | 74.0 | 78.5† | 64.8 | 56.0 | 62.0 | 69.7‡ |
| Moderate | 28.2 | 25.2 | 36.7 | 33.5 | 21.1 | 18.1† | 24.7‡ | 30.8 | 29.7 | 22.8‡ |
| Excessive | 9.0 | 9.2‡ | 13.8 | 16.2‡ | 4.9‡ | 3.4†‡ | 10.6‡ | 13.3‡ | 8.3‡ | 7.5‡ |
| 5 or more daily fruit/vegetable servings | 41.9 | 51.4 | 41.7‡ | 53.8 | 42.0‡ | 49.9 | 37.8‡ | 50.7 | 52.8‡ | 53.0‡ |
| **Diabetes (number)** | **478** | | **196** | | **282** | | **253** | | **225** | |
| Current smoker | 15.1 | 11.7* | 16.5‡ | 13.1‡ | 14.1‡ | 10.7‡ | 20.7‡ | 14.7‡ | 12.3‡ | 10.1‡ |
| Physically active | 49.7 | 56.2* | 53.5 | 64.2 | 47.0 | 50.7 | 48.4 | 64.2 | 50.4 | 51.7‡ |
| Alcohol consumption | | | | | | | | | | |
| Never or low | 66.8 | 72.5 | 53.2 | 61.8 | 76.3 | 80.6 | 64.2 | 71.6 | 68.2 | 73.1 |
| Moderate | 23.0 | 22.5 | 29.9 | 32.0 | 18.2‡ | 15.3†‡ | 25.6‡ | 21.5‡ | 21.6 | 23.1‡ |
| Excessive | 10.2‡ | 5.0*‡ | 16.9‡ | F | 5.5‡ | F | 10.2‡ | 6.9 | 10.2‡ | F |
| 5 or more daily fruit/vegetable servings | 34.5‡ | 41.8 | 28.1‡ | 37.3‡ | 40.1‡ | 45.7‡ | 34.4‡ | 42.8‡ | F | F |
| **Cancer (number)** | **497** | | **227** | | **270** | | **232** | | **265** | |
| Current smoker | 17.2 | 13.5* | 19.7‡ | 15.8‡ | 14.9‡ | 11.4‡ | 31.2‡ | 23.4‡ | 11.8‡ | 9.7‡ |
| Physically active | 49.8 | 51.9 | 51.4 | 57.1 | 48.4 | 47.3 | 44.6 | 57.3 | 52.1 | 49.6 |
| Alcohol consumption | | | | | | | | | | |
| Never or low | 59.9 | 63.4 | 56.8 | 57.1 | 63.5 | 70.7 | 47.1 | 61.7 | 66.0 | 64.2 |
| Moderate | 30.5 | 29.9 | 33.5 | F | 27.2 | F | 40.7‡ | 26.4‡ | 25.7 | 31.5 |
| Excessive | 9.5‡ | 6.7‡ | 9.7‡ | F | 9.4‡ | F | 12.2‡ | F | 8.3‡ | F |
| 5 or more daily fruit/vegetable servings | 37.9 | 43.2‡ | 33.9‡ | 32.9‡ | 40.8‡ | 50.9‡ | 39.9‡ | 54.9 | 32.5‡ | F |
| **Stroke (number)** | **368** | | **156** | | **212** | | **100** | | **268** | |
| Current smoker | 17.0 | 12.5*‡ | 16.2‡ | 14.7‡ | 17.6‡ | 10.6‡ | 34.7‡ | 26.2‡ | 13.8‡ | 10.0‡ |
| Physically active | 49.6 | 46.2 | 59.0 | 59.4 | 41.9 | 35.5† | 54.6‡ | 56.4‡ | 48.3 | 43.6 |
| Alcohol consumption | | | | | | | | | | |
| Never or low | 70.1 | 77.4* | 62.0 | 74.1 | 76.4 | 80.0 | 72.4 | 73.2 | 69.6 | 78.3 |
| Moderate | 19.2‡ | F | F | F | F | F | F | F | F | F |
| Excessive | 10.7‡ | F | F | F | F | F | F | F | F | F |
| 5 or more daily fruit/vegetable servings | F | 33.0‡ | F | F | F | F | F | F | F | F |
| **Respiratory disease (number)** | **409** | | **149** | | **260** | | **190** | | **219** | |
| Current smoker | 25.2 | 23.9 | 26.3‡ | 24.7‡ | 24.5 | 23.4‡ | 36.2‡ | 33.0‡ | 21.0 | 20.4 |
| Physically active | 51.6 | 44.1* | 58.2 | 52.5 | 47.2 | 38.6 | 55.4 | 59.3 | 49.9 | 37.4‡ |
| Alcohol consumption | | | | | | | | | | |
| Never or low | 64.0 | 56.7 | 56.6 | 43.6 | 68.4 | 64.5 | 46.0‡ | 48.1 | 71.6 | 60.4 |
| Moderate | 23.3 | 35.4* | 22.8‡ | F | 23.5‡ | F | 27.6‡ | 38.3‡ | 21.4 | 34.1 |
| Excessive | 12.8‡ | 7.9*‡ | 20.6‡ | F | F | F | 26.4‡ | F | 7.0‡ | F |
| 5 or more daily fruit/vegetable servings | 27.1‡ | 31.4‡ | F | F | 30.2‡ | 33.3‡ | 31.3‡ | 33.7‡ | F | F |

* significantly different from pre-diagnosis ($p<0.05$)
† pre- to post-diagnosis change significantly different from change among men ($p<0.05$)
‡ pre- to post-diagnosis change significantly different from change among 50-to-64 age group ($p<0.05$)
‡ use with caution
F too unreliable to be published

**Notes:** Tests of group differences by sex and age group were conducted using logistic regression in which post-test differences were predicted by group membership, controlling for pre-test differences. Significant differences indicate greater change from pre-test to post-test in one of the groups. Pre-values are based on the last interview wave in which respondents reported no diagnosis of the condition. Post-values are based on the same interview wave in which respondents reported diagnosis of the condition (0 to 2 years). Missing information for alcohol and fruit and vegetable consumption is due to small cell size (n <10). Fruit and vegetable consumption data were available only for cycles 5 to 7.

**Source:** 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

diagnosed with respiratory disease were the exception—not only were they more likely to smoke before diagnosis (25%), but there was no significant decrease in the percentage who were smokers after diagnosis.

Except for those with respiratory disease, smokers' daily cigarette consumption fell significantly (Figure 1). This decline in smoking may, in part, be due to the new diagnosis, but it may also reflect a community-wide trend—even among the healthy comparison group, the percentage of current smokers (N = 1,103) decreased slightly over the two-year period from 23% to 21% ($p < .05$). However, regardless of the chronic condition, the majority (approximately 75%) of those who smoked continued to do so after diagnosis (Table 1).

### Leisure-time physical activity

Only people with diabetes reported a post-diagnosis increase in leisure-time physical activity. Initially, close to 50% of this population engaged in physical activity at least three times a week; after diagnosis, the figure was about 56%. In addition, only among people diagnosed with diabetes did average energy expenditure change significantly: from 1.1 to 1.4 kcal/kg/day ($p < .001$). Although significant, this increase is not large. Also, it was people aged 50 to 64 with diabetes who tended to become active; seniors were less likely to increase their activity.

And among people diagnosed with respiratory disease, the percentage who were physically active fell from 52% to 44%. Again, age was a factor, as seniors were more likely to become inactive post-diagnosis than were 50- to 64-year-olds.

This was in contrast to the pattern of physical activity among the healthy comparison group. Initially, this group (N = 1,053) was more likely to be physically active during leisure-time, and their likelihood of being active rose over the two-year period from 58% to 63% ($p < .05$).

## *The data*

The longitudinal National Population Health Survey (NPHS) followed 17,276 individuals who were aged 12 or older in 1994/1995. Interviews were conducted every two years. The NPHS design, sampling procedures, data collection, and response rates by cycles are described in detail elsewhere.[12] Data for this study are from cycles 1 to 7 (1994/1995 to 2006/2007) and pertain to respondents aged 50 or older at the first cycle (N=5,404) who initially reported no chronic condition, but who, in a subsequent cycle, reported a new diagnosis of one of five chronic conditions. The mean age of the sample was 65.5 (SD = 10.3), and slightly more than half (54.1%) were women. The primary focus is a prospective comparison of pre- and post-diagnosis (two years) health behaviour among people reporting a new diagnosis during the 12 years covered by the study. Cycles 2 and 3 were used to examine health behaviour changes among a healthy comparison group who did not have any of the five health conditions.

At each cycle, respondents were asked, "Do you have any of the following long-term (lasting or expecting to last at least six months) conditions that have been diagnosed by a health care professional?" The five conditions selected for this analysis were "heart disease," "cancer" (skin cancer excluded), "effects of stroke," "chronic bronchitis or emphysema" (asthma excluded), and "diabetes."

The smoking measures used in this study were self-reported smoking status (never, former or current) and number of cigarettes per day.

Physical activity was measured by the reported frequency and duration of participation in 20 leisure-time activities (for example, walking for exercise, yoga) in the previous three months. Participation in any activity at least three times per week was considered "physically active." A continuous measure of energy expenditure (kcal/kg/day) was derived from the frequency and duration of activities.[13]

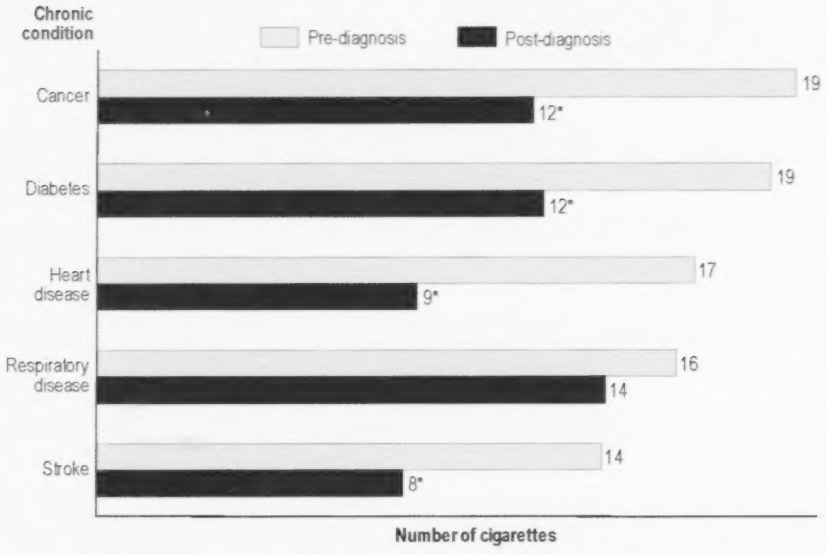
Respondents' alcohol consumption was defined as *never or low* (never drinks to less than 1 drink per week), *moderate* (2 or fewer drinks per day and 1 to 14 drinks per week for men; 2 or fewer drinks per day and 1 to 9 drinks per week for women), and *excessive* (more than 2 drinks per day or more than 14 drinks per week for men; more than 2 drinks per day or more than 9 drinks per week for women).[14]

Responses to six questions about the frequency of fruit and vegetable consumption were used to determine what percentage attained minimum recommended daily intake. The recommendation for servings per day is based on an average portion size of 80g, which, studies suggest, approximates the amount consumed on each occasion.[15] The current target is seven servings of fruit and vegetables per day for Canadians older than age 50,[16] but fewer than 12% of the sample reported consuming this amount. Therefore, respondents were classified as meeting the recommended minimum if they reported consuming fruit and vegetables five or more times per day. This is consistent with Canada's Food Guide recommendations before 1992,[17] as well as the minimum recommended by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO),[18] and in several other countries.[17-20] Diet information was available only for cycles 5, 6 and 7 of the NPHS.

Analyses were weighted and adjusted for the complex sampling design using SAS 9.2 or SUDAAN 10.0 with balance repeated replication. Rao-Scott chi-square[21] obtained from SAS PROC SURVEYFREQ using discordant cells (0-1 versus 1-0 responses) was used to test for significant change between pre- and post-diagnosis.[22] (The McNemar test, which is typically used for this comparison, is not available in SAS PROC SURVEYFREQ or SUDAAN.) Paired t-tests were used to compare pre- and post-diagnosis health behaviours with continuous measures. Logistic regression models controlling for pre-diagnosis levels of health behaviours were used to compare sex and age differences in health behaviour pre- and post-diagnosis. A significant coefficient for one of these socio-demographic variables indicates greater change from pre- to post-diagnosis in one of the groups.[23]

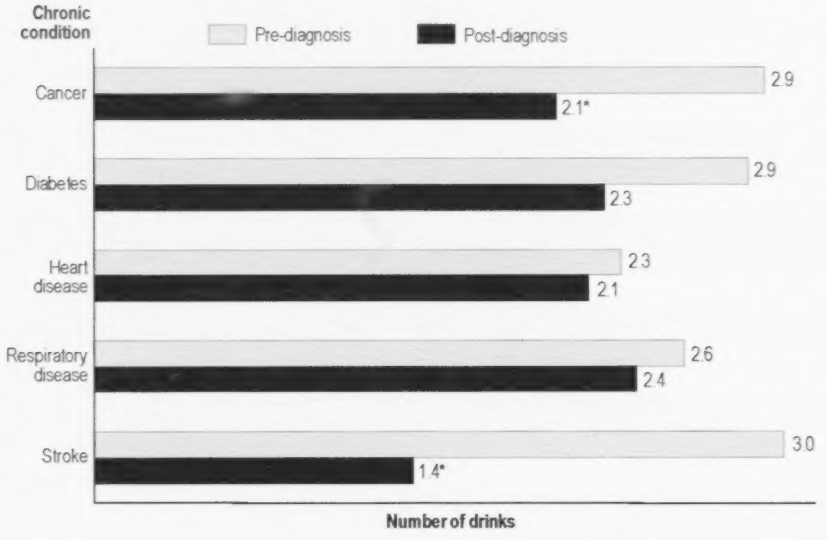
This study has a number of limitations. Chronic conditions and health behaviours were based on self-reports. While it is unlikely that respondents would report having been diagnosed with a major condition if it did not exist,[24-28] underreporting is possible.[29] Self-reported smoking status is generally considered accurate. The NPHS leisure-time physical activity measure was more extensive than those available in most large health surveys, but was, by definition, limited to leisure time. Other physical activity, for example, at work, for transport and for rehabilitation, was excluded. Fruit and vegetable consumption was based on the reported frequency of consumption, and may not correspond precisely to the number of servings. NPHS data were collected every two years, so behaviour changes between cycles may have been missed; for example, smoking cessation attempts and remission. Moreover, changes observed over a two-year period may not be maintained over the long-term.

**Figure 1**
**Mean number of cigarettes smoked per day, pre- and post-diagnosis of chronic condition, current smokers aged 50 or older, Canada, 1994/1995 to 2006/2007**




* significantly different from pre-diagnosis ($p<0.05$)
**Note:** Because of rounding, bars indicating the same number of cigarettes may have different lengths.
**Source:** 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

**Figure 2**
**Mean number of alcohol drinks consumed per week, pre- and post-diagnosis of chronic condition, current drinkers (past 12 months) aged 50 or older, Canada, 1994/1995 to 2006/2007**




* significantly different from pre-diagnosis ($p<0.05$)
**Note:** Because of rounding, bars indicating the same number of drinks may have different lengths.
**Source:** 1994/1995 to 2006/2007 National Population Health Survey, longitudinal square file.

Fear or concern that physical activity might be dangerous could be a deterrent for individuals with chronic conditions, particularly, heart-related ailments. However, for clinically stable patients without ischemia, exercise under the supervision of a physician has less risk than sedentary behaviour.[30]

## Alcohol consumption

Following a diagnosis of a chronic condition, individuals' alcohol consumption tended to decrease. For example, among those diagnosed with diabetes, the percentage who drank excessively (more than 2 drinks per day or more than 14 drinks a week for men; more than 2 drinks per day or more than 9 drinks a week for women) fell from about 10% to 5% (Table 1). Among those with respiratory disease, the prevalence of excessive drinking declined from almost 13% to 8%. Current drinkers diagnosed with cancer or stroke averaged significantly fewer drinks each week (Figure 2).

Alcohol consumption among the healthy comparison group remained stable over the study period—16% drank excessively, 55% drank moderately, and 29% abstained or drank very little.

## Fruit and vegetable consumption

Before they were diagnosed, the percentage of the study population who averaged five or more servings of fruit and vegetables a day ranged from 27% 42%. No significant post-diagnosis increases emerged in the percentages eating the minimum number of servings, although among those with diabetes, the average daily number of servings rose from 4.4 to 5.2 ($p < .01$). The fruit and vegetable intake of the healthy comparison group did not change over the study period, with approximately 32% consuming five servings a day.

## Conclusion

Secondary prevention can improve longevity, enhance quality of life, and reduce medical expenses. This study reveals that people rarely made positive changes in lifestyle behaviours after they had been diagnosed with a chronic

condition. Smoking cessation and reductions in the number of cigarettes smoked were the changes most commonly reported, but the vast majority of smokers continued to smoke.

People with diabetes were the most likely to report positive behaviour changes, although the improvements were modest. Those diagnosed with diabetes reduced smoking and excessive drinking and increased their leisure-time physical activity and fruit and vegetable consumption. By contrast, people diagnosed with respiratory disease reported no change in smoking or fruit and vegetable consumption, and were less likely to be physically active. Over the same period, a reduction in excessive drinking was the only change in health behaviours reported for this group. ■

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